

**CDS130 Mid-term exam**

- Be sure your exam booklet has 7 pages.
- Write your name at the top of each page.
- This is a closed book exam.
- You may not use a calculator.
- You may not use MATLAB during exam.
- Absolutely no interaction between students is allowed.
- Each question is worth 5 points. Partial credit may be awarded **ONLY** if work is shown.
- Duration for this exam: 50 minutes.

**Q1.**  $(-125)_{10} = (?)_2$  (using sign and magnitude binary number notation) . (5 points)

- A) 1000 0011
- B) 1111 1101
- C) 1111 1100
- D) 0111 1100
- E) None of the above

Answer:

**Q2.**  $(0311)_4 = (?)_{10}$  (5 points)

- A) 20
- B) 21
- C) 64
- D) 53
- E) None of the above

Answer:

**Q3.** (5 points) The minimum number of bits needed for multiplying two 6-bit integers without overflow?

- A) 8
- B) 9
- C) 10
- D) 11
- E) 12

Answer:

**Q4. (5 points)** If an arbitrary 8 bit binary number is multiplied by 8, what is the maximum number of bits required to write that product as a binary number?

- A) 9
- B) 10
- C) 11
- C) 12
- D) 16

Answer:

**Q5. (5 points)** How many unique combinations of 1s and 0s are possible with 9 bits?

- A) 512
- B) 511
- C) 1024
- D) 256
- E) None of the above

Answer:

**Q6. (5 points)** Which of the following is not a valid representation in the number systems specified:

- (A)  $010010001_2$ ,
- (B)  $12345_6$
- (C)  $765_8$
- (D)  $EHDCBA_{16}$
- (E) None of the above

Answer:

**Q7. (5 points)** Convert hexadecimal  $109E_{16}$  into binary.

- A) 1010011111
- B) 0001000010011110
- C) 11011011110
- D) 101010011110
- E) None of the above

Answer:

**Q8.** (5 pints) Here is a two's complement representation of an decimal integer: 0110010  
Form the 7-bit negative equivalent of this binary integer use the two's complement method:

- A) 1001110
- B) 1011000
- C) 1001101
- D) 1110010
- E) None of the above

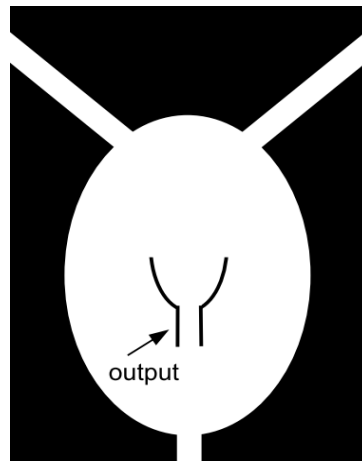
Answer:

**Q9.** (5 points) What is the 8-bit result of multiplying the following two 5-bit numbers?

$$\begin{array}{r} 10111 \\ \times 01101 \\ \hline \end{array}$$

Assuming an unsigned representation, is there overflow? (circle one) yes no

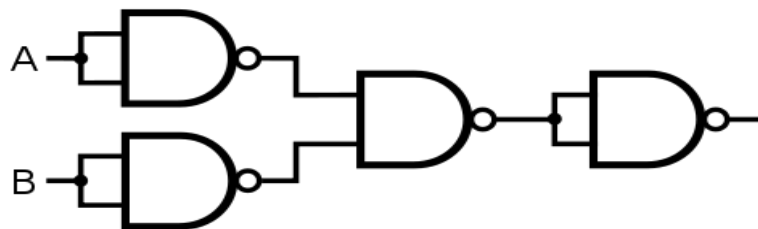
Q10. (5 points) Water flows into one, both, or none of the two white tubes at the top. What logic gate does it produce from the output indicated?



- A) AND
- B) OR
- C) NAND
- D) NOR
- E) XOR

Answer:

Q11. (10 points) What logic gate is equivalent to the logic circuit shown below? Draw the logic gate.



Answer:

**Q12.** (10 points) What is the output of the following MATLAB code:

```
clear;  
A(4) = 2;  
A(1, 2:5) = 3:6;  
A
```

- A) A = 1 2 3 4 5
- B) A = 0 3 4 5 6
- C) A = 2 3 4 5 6
- D) A = 0 3 4 2 6
- E) None of the above

Answer:

**Q13.** (10 points) What is the output of the following MATLAB code:

```
clear;  
A = 0.5;  
A = [1:0.2:1.5; 0.5:-0.1: 0.3];  
for myVar = 0.2:0.5:1.3  
    A = A * myVar;  
end  
sum(A)
```

Answer: ans =

**Q 14.** (10 points) Write the expression for the output resulting from executing the following MATLAB code:

```
clear;  
myMat(3,3)=0.0;  
myMat(1,2) = 1.5;  
myMat(3,3) = 2.5;  
myMat(1,2) + myMat(3,3);  
sin((myMat(1,2) ^ myMat(3,3))/8.0)  
ans=
```

Answer:

**Q15.** (10 points) Create a variable called result. Assign it a value of zero. Then create a FOR loop such that when completed, the variable result holds the value of the sum

$$1/1001 + 2/1000 + 3/999 + \dots + 1000/2$$

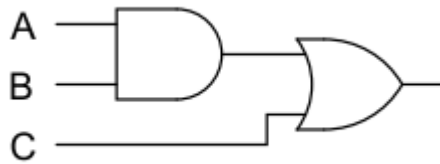
Answer:

### EXTRA CREDIT PROBLEMS

1. (5 points) Set up any 3x3 matrix A. Write some command-line statements to perform the following operation: Interchange column 2 and 3.

Answer:

2. (5 points) Using only NAND gates, draw a circuit equivalent to the given circuit.



Answer: